FINANCIAL DISTRESS AND USE OF MENTAL HEALTH CARE: EVIDENCE FROM ANTIDEPRESSANT PRESCRIPTION CLAIMS

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Abstract: Using nationwide county-level longitudinal data, we show that recent declines in housing prices are associated with an increased utilization of antidepressant prescriptions among the near elderly. Our results persist in difference-in-difference models using either all non-antidepressant drugs or statins as controls.

Keywords: financial distress, housing crisis, mental health, prescription

Highlights: We study the impact of the housing crisis on the use of mental health treatment. We focus on the near elderly, among whom housing constitutes a substantial share of wealth holdings. For this population, prescription fills for antidepressants rise with falling county-level housing prices between 2006 and 2009. This finding is not due to an independent effect of the housing crisis on across-the-board use of medications.

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1. Introduction

The housing market upheaval of the late 2000s hit many communities with record-setting declines in home values. According to the Freddie Mac Housing Price Index (HPI), from 2006 to 2009 housing prices experienced a 20-percent drop, the steepest witnessed in US history. We study the impact of the housing crisis on the use of mental health care by examining the use of antidepressant prescription drugs among the near elderly. One motivation for our focus on those age 55-64 is that recently released statistics show that suicide rates spiked sharply among this age group during this time period (Parker-Pope, 2013). This raises questions about the potential causes of a downturn in mental health among this population in particular. We investigate the potential role of housing because prior economic research has pointed out that this population has a high rate of home ownership and a high proportion of their savings held in the form of housing assets (Lusardi and Mitchell, 2007; Gustman, Steinmeier, and Tabatabai, 2011).

The expected effect of financial distress on the use of mental health treatment is ambiguous (Catalano, 2009). On the one hand, deteriorating economic conditions resulting from the housing crisis could increase the use of antidepressant medications due to elevated stress. On the other hand, economic stress could reduce the use of mental health treatment via reductions in access and ability to pay (Lusardi, Schneider, and Tufano, 2010),[1] although the links between work, income and stress are complex (Ruhm, 2000).

Our empirical strategy is motivated by these potentially important but countervailing effects. Specifically, we first implement a baseline analysis that evaluates the link between changes in local housing prices and antidepressant prescription volume. We complement this analysis with a difference-in-difference (DD) strategy that controls for contemporaneous changes at the local level in a) all other drugs and b) medications known as "statins" used to treat high cholesterol.

This paper contributes to the existing literature on the impact of the housing crisis by providing clear empirical support for the association between aggregate movements in housing prices and the use of antidepressants.[2] We find that the recent housing crisis is associated with increased use of antidepressant prescriptions. Our estimates indicate that the housing crisis can explain nearly a quarter of the increase in antidepressant use among the near elderly from the time with the highest HPI to the time with the lowest HPI during our study period. These results persist when we employ the DD models, albeit their magnitudes are attenuated. This supports the hypothesis that the prevalence of depression itself, which is among the diseases that are more sensitive to stress, is influenced by a decline in the HPI.

2. Data and methods

We utilize a large national dataset of prescription drug claims covering December 2004 through December 2009 from the Source Healthcare Analytics database (SHA, formerly Wolters Kluwer Health Source Lx database.).[3] Prior research has demonstrated that prescription drug use

[1] A study by Case, Quigley and Shiller (2005) finds evidence that variations in housing market wealth, as compared to stock market wealth, have larger effects on household consumption.

[2] Other studies have looked at the impact of housing prices on birth rate (Dettling and Kearney, 2011; Lovenheim and Mumford, forthcoming) and college choice (Lovenheim and Reynolds, 2012). Another study by Currie and Tekin (2011) finds a strong link between foreclosures and hospitalization using hospital and emergency room visits data from four states.

[3] SHA acquires these data primarily from electronic switches that transmit claims between pharmacies and third parties such as pharmacy benefit managers. The data also include some "cash pay" prescriptions that do not generate any claims.

is strongly and positively correlated with disease prevalence (e.g., Chini et al., 2011; Cossman et al., 2010). Our data include 505 million prescriptions filled by patients who were at least 55 years old by December 2004 and under 65 years old at the time they filled the prescription. These data cover 2,861 counties across all 50 states from approximately 32,000 pharmacies, including all of the major chains, other retail such as grocery stores or local pharmacies, mail-order, hospital and institutional pharmacies such as long-term care facilities. These data have been used in previous studies of prescription drug use (e.g., Ketcham and Simon (2008)).

The SHA database allows us to use the National Drug Classification code for each medication to identify a set of 35 drugs within the antidepressant therapeutic class.[4] We aggregate the claim-level data for the near elderly by county-by-month to use in conjunction with data on local housing prices.

The housing price data are from the Freddie Mac HPI. This is compiled by analyzing transactions on single-family homes serving as collateral on loans that are purchased by Freddie Mac and Fannie Mae. This index, available at both the aggregated MSA and state levels, is considered a comprehensive and reliable measure of housing prices (e.g., Iacoviello, 2005). We construct the county-level HPI using the HPI index at the MSA level for counties located within MSAs (80% of the counties) and at the state level for non-MSA counties.

In addition, because the housing crisis overlaps with declining labor market conditions during the later months of our study period, we also account for the impact of the subsequent recession occurring throughout 2009 by controlling for contemporaneous changes in unemployment. These unemployment data are reported at the county-month level by the United States Bureau of Labor Statistics Local Area Unemployment Statistics program.

Our baseline model for the effect of housing prices on antidepressant use is specified as:

$$y_{istm} = \beta_0 + \beta_1 HPI_{istm} + \beta_2 UER_{istm} + \alpha_i + \alpha_m + \omega_{st} + \varepsilon_{istm}$$

where $y_{istm}$is the log of the number of prescriptions filled for drugs within the antidepressant therapeutic class by the near elderly in county *i* state *s* year *t* and month *m*.[5] *HPI* measures the housing price index and is our primary independent variable of interest. UER measures the county unemployment rate. The baseline model also includes county fixed effects α_i to control for time-invariant heterogeneity at the county level, month fixed effects α_m to account for seasonality, and state-year fixed effects ω_{st} to control for all time-varying state-level factors that might affect the usage of antidepressant drugs such as the state-specific effects of the financial crisis or state-wide changes in Medicaid coverage and eligibility. Robust standard errors are estimated by clustering at the state level (Bertrand, Duflo, and Mullainathan, 2004).

Our second models employ the DD strategy working under the assumption that changes in non-antidepressant drugs will capture the effect of the housing crisis on drug use in general for reasons not linked directly to the effects of the housing crisis on mental health. We first use all non-antidepressant drugs, and then a specific class, statins, to serve as a contemporaneous control group. These models take the form:

$$y_{gistm} = \gamma_0 + G_{anti} + \gamma_1 HPI_{istm} + \gamma_2 G_{anti} * HPI_{istm} + \gamma_3 UER_{istm} +$$

[4] These medications have FDA approval for the treatment of a variety of mood and anxiety-related conditions such as major depressive disorder and generalized anxiety disorder and are often used for the treatment of related symptoms such as insomnia. These medications account for well over 95% of all medications prescribed for major depression, as well as comorbid psychiatric conditions such as obsessive-compulsive disorder and generalized anxiety disorder. The names of these 35 drugs are listed in supplementary materials Table S-1.

[5] To deal with zero prescription in the data, we apply a log transformation to one plus the number of prescriptions.

$$\gamma_4 G_{anti} * UER_{istm} + \alpha_i + \alpha_m + \omega_{st} + \varepsilon_{gistm}$$

where y_{gistm} is the log of prescription volume for the county-month for class g, which is either antidepressants or the control group, and G_{anti} is the dummy for antidepressants. The primary parameter of interest is γ_2, which quantifies the relationship between housing prices and antidepressant prescription volume relative to the effect on the control group. The model also allows the effects of unemployment to differ between therapeutic classes. This DD approach has the additional advantage of eliminating any bias due to changes in the collection of the SHA data that may have been correlated with changes in local housing values.

3. Results

Figure 1 shows trends in the HPI and in antidepressant prescription volume nationwide from December 2004 to December 2009 for individuals aged 55 to 64. The values of both HPI and prescriptions are indexed to their December 2004 levels. The results show a remarkable pattern, with a correlation coefficient of -0.76. From 2005 through mid-2006 the data exhibit a persistent downward trend in antidepressant prescription volume as the HPI climbed through mid-2006. By mid-2007, antidepressant use began to climb while the HPI began to fall steadily, so that both return to their December 2004 levels at precisely the same time, October 2008. Beyond that, the HPI fell further through February 2009, reaching its nadir in the same month as antidepressant use reached its peak within the time period we study.

Table 1 shows the average county-by-month HPI, unemployment rate and antidepressant prescription volume separately for each year from 2004 to 2009. It also reports the volume of all non-antidepressant prescriptions and statins, again averaged by county and month.

The results from our baseline model reveal that HPI is negatively and significantly associated with antidepressant volume (β_1=-0.375).[6] Figure 2 provides a graphical illustration of the magnitude of this relationship. The 20% decline in housing prices experienced nationwide from its highest point in July 2006 to its lowest in February 2009 is associated with a 7.51% rise in antidepressant prescription volume (95% CI 0.83% – 14.18%). These estimates indicate that the housing crisis explains nearly a quarter (22%) of the 34% nationwide increase in antidepressant use among the near elderly from the highest to the lowest HPI during our study period. This estimated influence of HPI is net of any effects of unemployment and overall state-year factors, adding confidence that they represent true effects of the HPI rather than more general economic factors.

The results from the DD models also indicate a large, negative relationship between HPI and antidepressant use. Specifically, the key results of interest show that the negative association between HPI and antidepressant volume is significantly larger than the association between HPI and the prescription volume for all other drugs (γ_2=-0.226) and for statins (γ_2=-0.179). The magnitudes of these relative effects are illustrated in Figure 2, which shows that a 20% decrease in HPI yields a 4.52% (95% CI 0.59% – 6.55%) increase in antidepressant use relative to all other drugs and a 3.57% (95% CI 0.19% – 8.85%) increase relative to statins.

4. Discussion and conclusions

In the recent history of the US, few events have caused more economic upheaval than the housing crisis. Our analysis demonstrates that a statistically significant link exists between the decline in housing prices and the rise in pharmacological treatments for depression, anxiety, and

[6] Detailed results from these models are reported in the supplementary materials Table S-2 for the basic model and Table S-3 for the DD models. .

other co-morbid symptoms among the near elderly. Our results imply that the housing crisis was an important factor in the recent rise in antidepressant use among the near elderly, accounting for 22% of the rise in prescription volume between July 2006 and February 2009 as the housing prices fell from their highest to their lowest levels nationwide.

Our estimates of the magnitude of the impact of housing prices are substantial. Yet given the under-treatment of depression nationwide (e.g., Gonzalez et al., 2010), the prevalence of depression may have grown even more than indicated by the increased use of antidepressants that we observe here. Evaluating the effects of the housing crisis on antidepressant use among other age groups would prove insightful, as would continued research of the effects of the economy on mental health more generally. Such results, in conjunction with those from this study, help point out that the true economic consequences of the recent housing crisis may go far beyond the costs typically captured by macroeconomic measures such as lost property value.

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Figure 1. National Housing Price Index (HPI) and Antidepressant Prescription Volume among the Near Elderly, December 2004 – December 2009

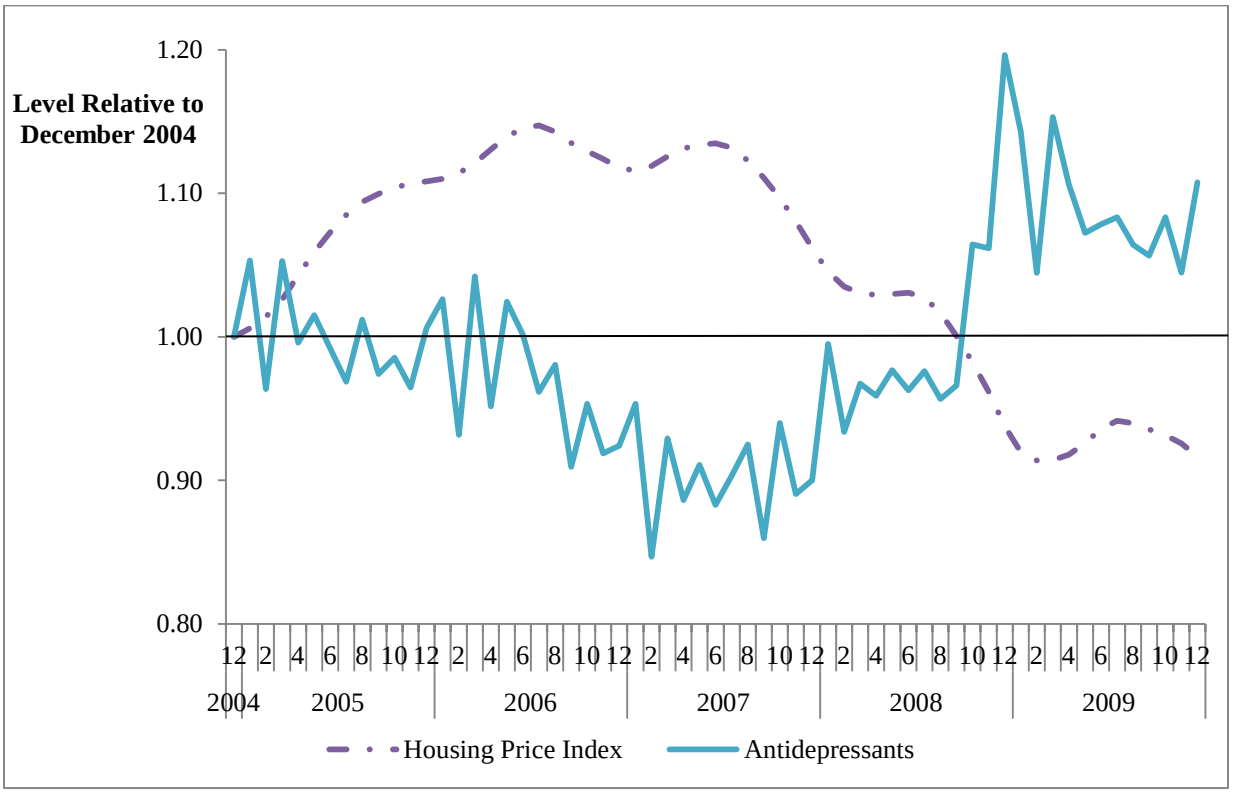

Figure 2. Estimated Relationship between County-by-month Housing Price Index (HPI) and Antidepressant Prescription Volume

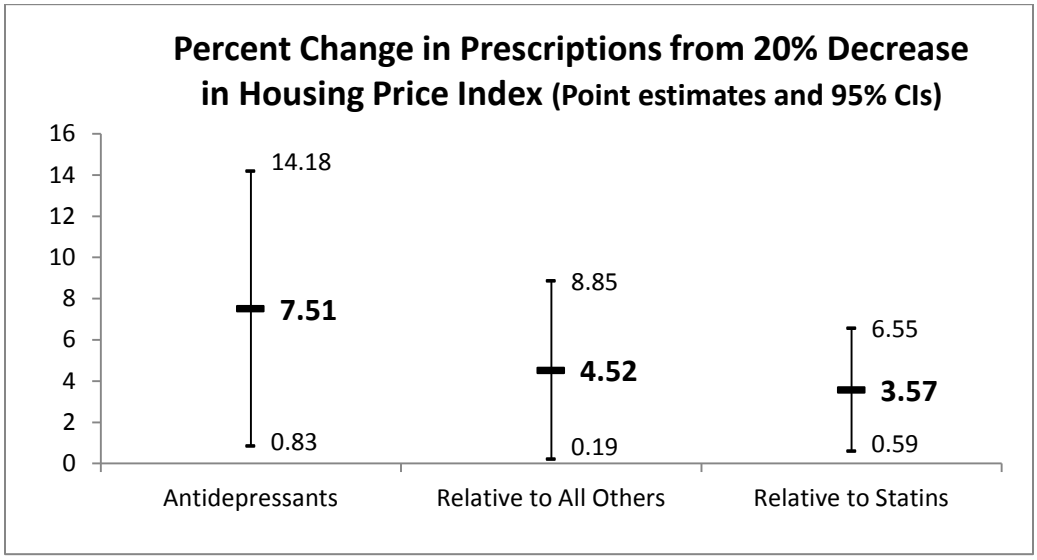

Table 1. County-by-month level variable means, by year

	2004	2005	2006	2007	2008	2009
Freddie Mac Housing Price Index						
Mean	125.5	132.1	140.2	141.5	134.9	127.9
Standard Deviation	18.6	23.8	27.0	25.6	21.2	19.2
Unemployment Rate						
Mean	5.6	5.4	5.0	4.9	5.9	9.4
Standard Deviation	1.9	2.0	1.8	1.9	2.2	3.2
Antidepressant prescriptions filled by near elderly						
Mean	192.9	192.9	187.8	182.4	200.0	218.0
Standard Deviation	545.6	570.5	521.0	442.0	587.2	651.4
All non-antidepressant prescriptions filled by near elderly						
Mean	2,972.3	3,054.0	3,033.5	3,039.4	3,434.4	3,871.6
Standard Deviation	8,551.3	9,527.9	8,857.5	7,582.2	10,393.4	11,892.9
Statin prescriptions filled by near elderly						
Mean	178.5	179.8	179.8	183.1	234.5	278.4
Standard Deviation	564.4	604.3	561.3	489.4	864.6	1,049.0

Note: 2004 includes December only.

Supplementary Materials

Table S-1. List of Drugs in the Antidepressant Therapeutic Class

Antidepressants		
AMITRIPTYLINE HCL	AMOXAPINE	CLOMIPRAMINE HCL
DESIPRAMINE HCL	DOXEPIN HCL	IMIPRAMINE HCL
IMIPRAMINE PAMOATE	MAPROTILINE HCL	MIRTAZAPINE
NORTRIPTYLINE HCL	PROTRIPTYLINE HCL	TRIMIPRAMINE MALEATE
ISOCARBOXAZID	PHENELZINE SULFATE	SELEGILINE
TRANYLCYPROMINE SULFATE	BUPROPION HBR	BUPROPION HCL
NEFAZODONE HCL	TRAZODONE HCL	TRAZODONE HCL/DIET8
CITALOPRAM HYDROBROMIDE	ESCITALOPRAM OXALATE	FLUOXETINE HCL
FLUVOXAMINE MALEATE	PAROXETINE HCL	PAROXETINE MESYLATE
SERTRALINE HCL	DESVENLAFAXINE SUCCINATE	DULOXETINE HCL
AMITRIP HCL/CL-DIAZEPOX HCL	AMITRIP HCL/CHLORDIAZEPOXIDE	VENLAFAXINE HCL
AMITRIPTYLINE HCL/PERPHENAZINE	PERPHENAZINE/AMITRIPTYLINE HCL	
Statins		
ATORVASTATIN CALCIUM	CERIVASTATIN SODIUM	FLUVASTATIN SODIUM
LOVASTATIN	PRAVASTATIN SODIUM	ROSUVASTATIN CALCIUM
SIMVASTATIN		

Table S-2. Estimates from Baseline Model of Housing Prices on Antidepressant Prescription Volume

Dependent Variable:	County-month Antidepressant Prescription Volume (log)
Freddie Mac Housing Price Index (log)	-0.3754**
	(0.1662)
Unemployment rate	0.0077*
	(0.0043)
Model Includes:	
Intercept	Yes
County Fixed Effects	Yes
Month Fixed Effects	Yes
State-Year Fixed Effects	Yes

Note: Robust standard errors, clustered at state level, are shown in brackets. *** p<0.01, ** p<0.05, * p<0.1; N=153,658.

Table S-3. Estimates from Difference-in-Difference Models of Housing Prices on Antidepressant Prescription Volume Relative to Other Prescription Drug Classes

Dependent Variable:	County-month Prescription Volume (log)	County-month Prescription Volume (log)
Model:	Antidepressants vs. All Other	Antidepressants vs. Statins
Antidepressants	-1.3421**	1.0717***
	(0.5639)	(0.3759)
Freddie Mac Housing Price Index (log)	-0.3524*	-0.3490**
	(0.1915)	(0.1662)
Antidepressants*Freddie Mac Housing Price Index (log)	-0.2259**	-0.1787**
	(0.1100)	(0.0758)
Unemployment rate	0.0228***	0.0218***
	(0.0051)	(0.0041)
Antidepressants*Unemployment rate	-0.0263***	-0.0239***
	(0.0049)	(0.0027)
Model Includes:		
Intercept	Yes	Yes
County Fixed Effects	Yes	Yes
Month Fixed Effects	Yes	Yes
State-Year Fixed Effects	Yes	Yes
Total effect of Freddie Mac Housing Price Index (log) for Antidepressants	-0.5783***	-0.5277***
	(0.1994)	(0.1630)
Total effect of Unemployment Rate for Antidepressants	-0.0035	-0.0022
	(0.0057)	(0.0043)

Note: Robust standard errors, clustered at state level, are shown in brackets. *** p<0.01, ** p<0.05, * p<0.1; N=307,316.